CONTENTS

1.0 INTRODUCTION 2
2.0 ECOLOGY & LANDSCAPE 3
2.1 Siting 3
2.2 Landscape 3
2.3 Heat Island Effect 3
2.4 Light Pollution 3
3.0 WATER 4
3.1 Consumption 4
3.2 Monitoring 4
3.3 Landscape 4
3.4 Stormwater 4
3.5 Sewerage 4
4.0 ENERGY USE 5
4.1 Passive Design 5
4.2 Energy 5
4.3 Monitoring 5
4.4 Lighting 5
5.0 INDOOR AIR QUALITY 5
6.0 THERMAL STRATEGIES 6
6.1 Thermal Mass 6
6.2 Cool Roof 6
6.3 Daylight 6
6.4 Outdoor Rooms 6
6.5 Natural Ventilation 6
6.6 Natural Air Conditioning 6
7.0 MATERIALS 7
8.0 SOCIAL 7
9.0 COST AND BUDGET 8
9.1 Transferable Technology and Economy of Scale 8
10.0 BRISBANE SUSTAINABLE HOME SMART HOUSING CHECKLIST 9
11.0 SITE ANALYSIS 10
12.0 DRAWINGS
12.1 Architectural
12.2 Landscape
12.3 Structural
12.4 Hydraulics
13.0 THERMAL COMFORT ANALYSIS
14.0 DRAFT SUSTAINABLE HOUSING CODE CHECKLIST

1.0 INTRODUCTION

Fort Road Estate

Bligh Voller Nield's design for this **unique project** will set a new benchmark in ecologically sensitive housing in the subtropics. As a model for the future, the demonstration home will be ecologically sensitive, **energy efficient, water conscious** and **healthy**.

Site

- The design respects the **intrinsic ecological value** of the indigenous vegetation, animal habitats and the nature of the Brisbane River corridor.

Design

- The design is an elegant, **contemporary Queenslander** with a relaxed **sub-tropical** atmosphere.
- It is a **healthy** and **green** home that minimises environmental impact and uses our resources responsibly.
- The home has seamless **indoor/outdoor**, spacious living.

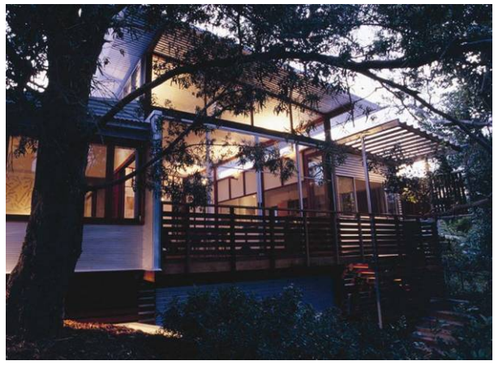
How

- An **integrated team** design approach has been adopted .
- **Creativity** in the design process by all team members has been encouraged.

Who

The project is strongly supported by a consortium of industry partners including the AGDF, PMM, Natural Lifestyle Homes, the YBE Partners, Urban Blueprint, Bligh Tanner Pty Ltd, Lincolne Scott Pty Ltd, Yurrah Pty Ltd, BCC, Centre for Subtropical Design and select materials and product suppliers.

Bligh Voller Nield deliver innovative, intelligent and principled design solutions that are focused on people and the environment.



2.0 ECOLOGY & LANDSCAPE

2.1 Siting

The building zone establishes a buffer of natural vegetation providing shade and insulation. The home is deliberately aligned between three significant existing trees and orientated to catch n-e breezes. The two storey plan minimises the footprint. The house is raised above the ground with a suspended timber floor to the lower level to allow natural drainage to flow under and to avoid soil compaction associated with slab on ground construction.

2.2 Landscape

The biodiverse and food producing landscape creates diversity. Native vegetation cover is retained and enhanced. The layering of groundcover, shrubs and trees creates spatial complexity in the vegetation. These self-sustaining landscapes minimise need for irrigation.

The landscape design is easy to understand and is a direct extension of the sustainable approach to the overall subdivision design emphasising biodiversity and water cycle management.

The landscape design creates a home within a garden, within a habitat. The landscape has a close relationship with the built form and the gardens are designed as external rooms.

The Entrance Room is a bridge that floats over the natural landscape to connect public with private space. The Entrance Room is dramatically aligned with the large tree to the north and the clump of two trees retained within the building zone to the south.

The Outdoor Living Rooms, the terrace under the big tree to the north and the southern terrace shaded by a grape vine covered trellis suit a subtropical lifestyle marked by al fresco living.

Play Rooms for rest and relaxation, exploring and playing incorporate water-wise plants based on a local native plant palette.

Food Courts are integrated to provide a range of edible gardens accessible from kitchen in the planter box and adjacent the northern Outdoor Living, a corridor of fruit trees and fingers of bush tuker reaching into the habitat rooms.

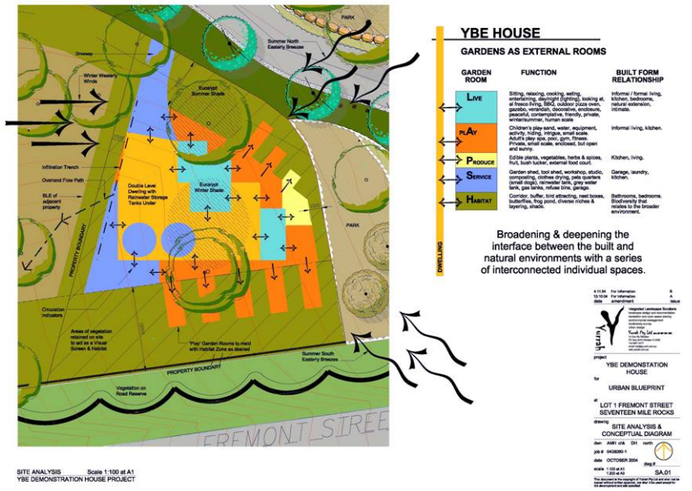
Under the House provides undefined space for storage, play, workshop, etc. Habitat Rooms are places for native flora & fauna to flourish undisturbed and connect the green corridor of the estate.

2.3 Heat Island Effect

Groundcover and shade to reduce reflection from paved areas around the home.

2.4 Light Pollution

External lighting is on movement and light sensor control.



3.0 WATER

3.1 Consumption

The extensive use of an integrated water management cycle incorporating four rainwater tanks with a total capacity of at least 20,000 litres, ultra violet and micro filtration technologies, reticulation of treated rainwater for WC flushing, washing machine, laundry, showers, bath, basins and kitchen sink, AAA efficiency rated fittings and fixtures and thermostatic mixers.

A demonstration grey water recycling system will be installed to provide treated greywater for garden irrigation. The complete installation will showcase the full potential allowed for in proposed changes to the Queensland Plumbing Act.

3.2 Monitoring

A smart meter is installed with display in prominent position to record town water, total potable and irrigation water use, as well as sewerage outfall.

3.3 Landscape

Water efficient landscape and irrigation due to the selection of local native and food producing plants elimination of lawn, drip irrigation, timer controlled night watering, and a high level of mulching.

3.4 Stormwater

Stormwater run-off is minimised by porous treatment to driveways, paths and terraces, and collection of significant volumes of the roof water for storage in the rain water tanks, only when the tanks are full will the stormwater overflow to the site. Overflow roofwater is directed to a purpose made bio-infiltration pit across the rear boundary.

The site handles stormwater by minimising non-porous materials to enhance the natural ability of the site to absorb rainfall and replenish groundwater. Surface run off and overland flow are addressed by the retention of the existing dry gully and drainage contours within the landscape design which is likewise directed to the bio-infiltration pit.

3.5 Sewerage

A reduced flow to sewerage is achieved by treating and reusing greywater on site, and using AAAA rated toilets and AAA efficiency rated fittings and fixtures generally.

4.0 ENERGY USE

4.1 Passive Design

The design is climate responsive and optimises passive principles. The home is orientated to the north/south orientation, and all windows and openings are protected from direct entry of sunlight and rain. All rooms designed to accommodate cross ventilation.

4.2 Energy

In addition to passive design, energy used to operate building is minimised through measures such as:

- 5 star energy rated appliances
- Low energy lighting strategies
- Gas boosted solar hot water system
- Gas cook-top with range hood flued to outside
- Photovoltaic powered lighting (selected) and fans (The extent of the installation and connection of the solar array to the ENERGEX network via an invertor is being considered)
- C Bus energy management and control system for selected lighting, ventilation, and selected white goods in the home

4.3 Monitoring

Metering and energy consumption is displayed using a display anywhere/mobile energy usage display system (Clipsal Centimeter).

4.4 Lighting

Daylight is optimised with a combination of direct daylighting, indirect daylighting, ceiling and wall mounted fixtures and tasklighting. Internal room finishes generally to be smooth, light coloured, and reflective.

Lighting power density (watts/m^2) is reduced by a lighting design based on energy conservation and flexibility of individual control combined with the appropriate use of lighting controls such as movement/light sensors for security lighting.

5.0 INDOOR AIR QUALITY

Openable doors and windows provide natural ventilation. The rangehood is flued to the outside.

Toxic materials including pvc, plastic paints, glues etc are avoided and low toxic finishes and materials are generally selected. Carpet is not used to limit dust accumulation.

A building flush out period will be included if necessary. Low emission cleaning practices and the identification of voc absorbing indoor plants may be included in a user manual.

6.0 THERMAL STRATEGIES

6.1 Thermal Mass

The lightweight ventilated and shaded home behaves as a traditional Queenslander in summer. Whilst in winter, the sunlit thermally massive core of concrete stairs and masonry walls combine with a high level of insulation to keep the home warm.

6.2 Cool Roof

The light coloured corrugated iron roof with insulated plasterboard ceiling and 1200mm wide eaves and metal hoods for shading windows help keep the home cool.

6.3 Daylight

Generous, well shaded windows provide daylighting. Glazed louvres to thermal chimneys introduce daylight to centre of home.

6.4 Outdoor Rooms

Indoor/outdoor living rooms enhance enjoyment of a subtropical lifestyle (screened north east verandah, 2 levels of deck to south, outdoor terraced seating areas, underhouse space).

6.5 Natural Ventilation

Windows are arranged as casements in a parallel configuration aligned with dominant wind directions or are louvres. The openable area needed for ventilation has been optimised in relation to consideration of heat loss in winter. Significant permeability internally is achieved by a combination of walls that do not extend to the ceiling and fanlights over doors. Ceiling fans may be introduced to increase velocity of air movement on very still days.

Thermal chimneys with operable louvres and continuous vents around the perimeter of the raked ceiling vent hot air to enhance cross ventilation with a buoyancy effect and provide night cooling in summer. Voids near the stair contribute to the stack effect and ventilation of the lower level.

The long thermal chimney is divided into three sections. Two thermal chimney shafts are positioned at opposite ends of the home, one over the living area, and the other over the bedroom wing and vent directly from the internal spaces. The central section works in conjunction with the continuous vents around the perimeter of the raked ceiling.

6.6 Natural Air Conditioning

The ceiling space behaves like a heat exchanger with the outside, and combined with the thermal mass and chimneys, creates a unique natural air conditioning system that harnesses night sky radiation for cooling and solar gain for heating.

The shutters are open for the thermal chimneys to operate in a passive mode; the shutters are closed and the fans are mobilised for the active mode. Low static, high air volume fans move air through the ceiling cavity to deliver the heated/cooled air. By ducting some of this air through the thermally massive wall, coolth can be stored in a summer night for the summer day, and similarly, the winter day's heat can be stored for the evening.

VENTILATION & CHIMNEY LOUVRE OPERATION		
Mode	Chimney Louvres	Fan Operation
SUMMER	Open	Off when air movement sufficient
Day		On if air movement insufficient (creates air movement and vents heat through roof opening)
Night	Open when passively venting	Off when passively venting
	Closed when actively venting	On when desired (distributes passive cooling to the internal spaces and to the thermal mass wall)
WINTER	Closed	Off (typically)
Day		On when desired (distributes passive heating cooling to the internal spaces and to the thermal mass wall)
Night	Closed	Off

7.0 MATERIALS

Healthy, renewable and recycled materials are being considered as a priority. The final selection of materials is not yet determined.

Construction generally is lightweight timber framing. Old/regrowth Australian hardwoods, endangered and rainforest species will not be used.

The timber framing will be an efficient and economical combination of plantation pine and laminated veneer lumber (LVL) also plantation sourced. Roofing will be traditional trusses from plantation pine. The structural flooring will be of plantation pine plywood to make a safe working platform during construction finished with engineered bamboo T& G flooring which is a plantation grown, fast growing, renewable resource.

The internal and external doors and windows will all be timber framed and locally made from plantation hoop pine. Plywood wall and ceiling finishes will feature throughout in combination with traditional plasterboard finishes. Kitchen and other joinery will be fabricated from plywood carcasses.

The exterior of the house will feature a cladding combination of light weight masonry panelling using recycled polystyrene and an exterior grade plywood cladding. Roofing is light weight, reflective, corrugated custom orb profile steel sheeting preferred in zincalume to maximise recycling potential and facilitate clean rainwater collection.

Low VOC water based paints will be used throughout and timber will be preserved with a natural plant based finish.

The use of PVC is minimised by, for example, the substitution of HDPE for plumbing pipework and natural floor finishes for vinyl, etc.

A physical barrier termite treatment method will be selected.

8.0 SOCIAL

The home is located within the largest proposed growth corridor in South East Queensland and yet is within 10 km of the Brisbane CBD, thus maximising the opportunity for public to visit and experience the home.

The specific selection of the home site within a best practice, bushland housing estate further enhances the public's appreciation of the home in a setting that demonstrates environmentally responsible development.

Monitoring the home during construction and occupation will provide an ideal educational setting in which to examine our relationship with where we live and the improved outcomes for business, community and government.

This aspirational home will catalyse an accelerated uptake of sustainable housing principles by demonstrating more socially, environmentally and economically sustainable housing solutions.

The home addresses safety, security and universal design issues. Accessibility initiatives go well beyond the basic requirements of the Smart Housing Guidelines facilitating equitable visitor access.

The Brisbane Sustainable Home integrates local, social and cultural contextual factors. It responds to, and contributes to, the enjoyment of a sub-tropical lifestyle, and reflects the principles of ecological sustainability by acknowledging the Queenslander's traditional character with an appropriate contemporary aesthetic.

This localised quality makes the bioregional character highly visible, and as a demonstration home the awareness of environmental issues will be increase for those who visit and ultimately occupy this home.

9.0 COST AND BUDGET

The size and cost of the Brisbane Sustainable Home was established by the comprehensive brief from AGDF. The brief included professional market research specific to the local area and market conditions of the proposed home. Both the Client Brief and the Return Brief were issued to YBE for early approval.

The completed design satisfies the approved brief and is consistent with the original area allocations of 300 square metres internal floor area and 350 m² overall.

The simple layout and structure of the home reflects the deliberate utilisation of framing materials and systems consistent with around 90% of new homes built in Queensland. The roof form is simple, symmetrical, traditional and inexpensive. The thermal chimney is an additional feature that extends the comfort of the home, but is not essential to it. The landscape plan is to supplement the existing remnant vegetation at modest cost.

Accordingly, the AGDF is satisfied that the home will be able to be delivered for the approved $350,000 construction cost. At $350,000 construction cost, the home will be highly relevant to the local housing market and to the visiting public.

In the spirit of making this home aspirational, attractive, interesting and as educational as possible, some less common materials, technologies and features will be deliberately incorporated. This is proposed to demonstrate products readily available in the marketplace, but perhaps not yet fully appreciated by the general public or Trades.

While the development of the home is not dependant on sponsorship, there are some extraordinary costs associated with delivering the home to standard of quality and environmental integrity required of a demonstration project. To assist defray the total cost of the home's development, and as allowed and encouraged by the YBE Programme Guidelines, a major sponsorship and support program is currently underway.

The extent of the response we receive from suppliers and manufacturers will enhance our ability to obtain goods and services at advantageous rates and contribute directly to our capacity to offer a high quality experience during the mandated six month Public Display Period. In fact, dependant on Sponsorship inputs, the AGDF is desirous of extending the Public Display Period to 9 or even 12 months.

9.1 Transferable Technology and Economy of Scale

The Brisbane Sustainable Home has been deliberately sited in a high profile, accessible and strategic location. As per the YBE Guidelines, the home responds directly to the local market demographics in terms of size, appointments and cost. This approach is considered a major plus, in that the completed home will appeal in a strong aspirational sense to the majority of the housing market. A home with this combination of sustainability, quality, price and the bushland location may never have been offered for public inspection before. In many ways our expectation is that these very factors will be a major attractant for the public and may provide the main impetus for inspection of the home and lead to a greater level of understanding of the sustainability issues.

While we hope that all segments of the housing market will be inspired to own a home with the characteristics of this one, we are appreciative that not all segments of the market are able to afford the $ 350,000 construction cost.

In response to an identified need to demonstrate affordability, we are developing a hybrid of the proposed design that will be showcased in our display area. This hybrid is directly based on the current design, but limits the first stage of construction to a 220m² three bedroom, one bathroom home on one level. Building in underneath would be an option to complete at a later stage. The hybrid model retains the integrity of the sustainable design.

Details of the hybrid home will be on display in the completed Brisbane Sustainable Home to ensure engagement and encouragement for all levels of the housing market. The cost of construction for such smaller hybrid would be in the $225 to 250,000 range depending on the selected materials, finishes and thermal and water management options.

The Fort Road Estate would not be the appropriate location to showcase this smaller hybrid as, like many contemporary housing subdivision, there are Developers Covenants which would not permit smaller scale and exposed lightweight structure and car parking. The smaller hybrid could well serve as a comparison with the Demonstration Sustainable Homes being proposed as part of the state wide YBE programme particularly given that the typical house size, land cost and sale price will be lower in other Queensland cities, towns and shires. Both the completed Brisbane Sustainable Home and the 220m² Hybrid Home will be displayed side by side with detailed cost information and a full schedule of the sustainable features and options.

10.0 BRISBANE SUSTAINABLE HOME SMART HOUSING CHECKLIST

Front Yard and Entrance
☒ Footpaths and driveways are gently sloped
Note: not achievable on the steep site
☑ The distance from car space to home is kept to a minimum
☑ The front entry is clearly visible from the driveway and footpath
☑ The street address is clearly visible
☑ Entrances are covered, have level landings and an outside light
☑ Casual surveillance of the front garden and the street is possible from the main living areas
☑ Walkways and landscaping lead visitors to entrances and away from private areas

Windows and Doors
☑ Interior doors that connect a garage to a building have a double cylinder dead bolt lock
☑ Laminated safety glass is used for all glass located within arm's reach of doors
☑ Exterior doors are hinged on the inside and have a double cylinder dead bolt lock with a minimum 25mm throw
☑ All doorways that open to the outside are well lit
☑ Wide hallways (1200mm) and doors (850mm)
☑ Stepless entries on all doorways
☑ Windows are located on north-facing walls for maximum exposure to winter sun
☑ Doors and windows are shaded from the sun and rain
☑ The location of the windows and doors provide for cross-ventilation
☑ Windows and doors are fitted with insect and security screens,
Note: predominately insect screens

Kitchen
☑ Reduced-slip flooring
☑ Clear floor space
☑ The kitchen position provides good visibility to inside and outside play areas
☑ Task lighting is provided over sink, stove and work surfaces
☑ Drawers and cupboards are located away from the stove/oven
☑ The kitchen does not double as a passageway

Bathrooms & Laundries
☑ Space to manoeuvre and hobless showers
☑ Easy to use taps, such as lever-type, with hot and cold clearly marked
☑ Walls are reinforced for the future fixing of hand-rails near bath, shower and toilet
☑ Bath taps are out of reach of small children
☑ Electrical outlets are positioned so that appliance cords do not extend across basins, or vanity units
☑ Childproof cabinet for the safe storage of poisons and medicines
☑ Reduced-slip floors
☑ A high shelf or a cupboard with childproof locks is provided
☑ Bathroom and toilet doors are fitted with removable hinges for emergency release
☑ Low water volume toilets and taps are installed

Bedrooms
☑ Located conveniently close to a bathroom
☑ Telephone and cable jack is installed
☑ A light switch is within easy reach of the bed

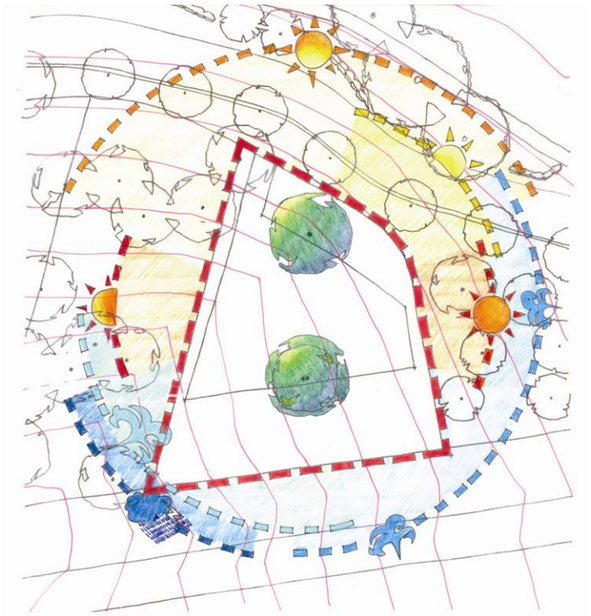
Stairs, Balconies & Elevated Verandahs
☑ Adequate lighting with switches inside
☑ Balustrades are high enough to prevent a child from climbing over
☑ Gaps between the vertical rails below the balustrade are small enough to stop a small child getting their head caught or objects falling through
☑ Stairs are a straight-run and at least 1,000 mm wide
☑ The whole stair area is well lit by both natural and artificial light, which does not cast shadows or dazzle the user

Electrical Outlets and Controls
☑ Electrical switches, outlets and mechanical system controls are in easily accessible locations, reachable from both sitting and standing positions
☑ Power outlets are safety-shuttered or plugged
☑ 'Safety Switches' are fitted to protect all circuits in the house – at least three devices are fitted so that some power remains when a fault occurs
☑ Rocker-type light switches have been installed
☑ Circuit breaker panel located on main floor for easy access
☑ Colour contrast can be used to help people find switches more easily
☑ Smoke alarms are hard wired in
☑ Sufficient power points have been provided to avoid trailing flexes and double adapters

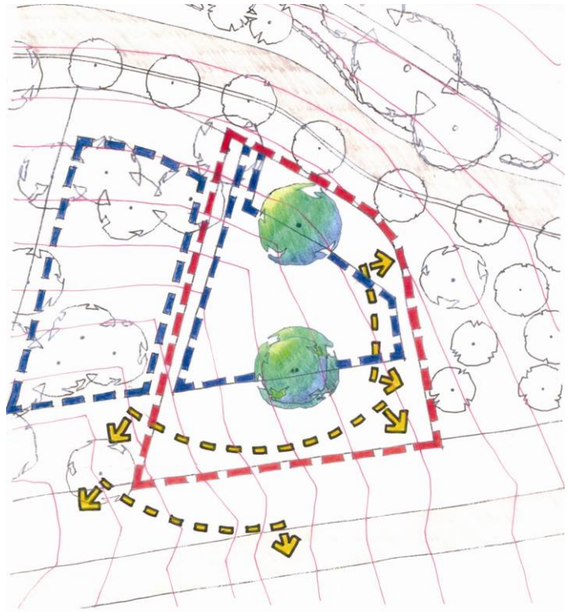
General Considerations
☑ Main living level contains a kitchen, living room, bathroom and a space suitable for a bedroom
☑ Layout is simple and logical with no obstructions or hazards
☑ Evacuation is easy in the event of a fire
☑ The long axis of the building is orientated east-west, so that the long length of the building faces north-south
☑ Living areas are located to capture winter sun and summer breezes, while utility areas serve to act as a buffer
NA Vents exist to eaves and at the roof –
Note: refer thermal strategies report
☑ Large enough to accommodate normal furnishings and provide adequate space for traffic
☑ Insulation in the walls and ceilings
☑ Materials with low long-term maintenance costs

Garden
☑ The driveway is separated from play areas
☑ Reduced-slip paved areas are designed for surface water to drain away easily
☑ There are no toxic or poisonous plants
☑ There is shade over the play areas
NA All garden gates are self-closing and self latching and have childproof locks
☑ There is a lockable storage area for poisons, chemicals and tools etc

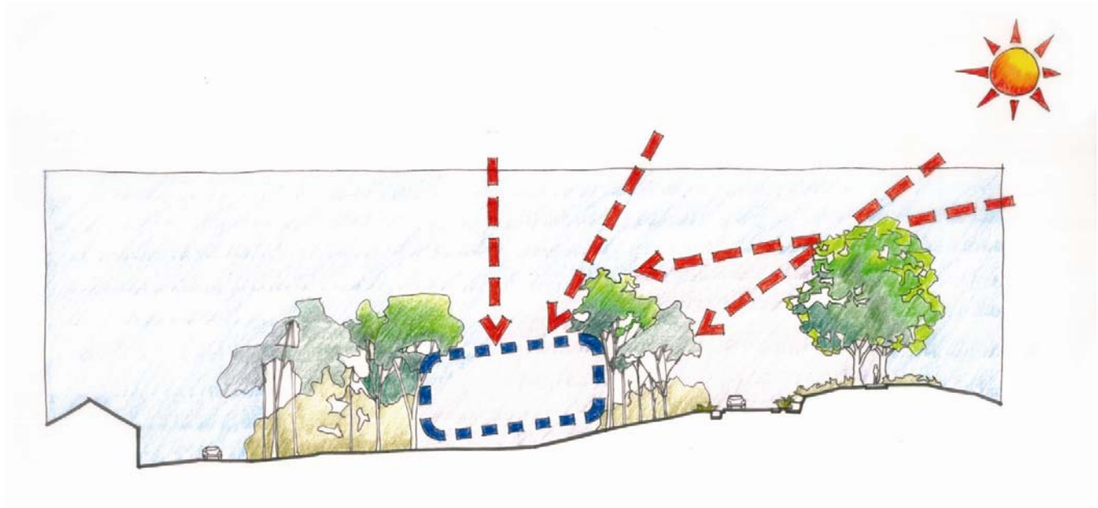
11.0 SITE ANALYSIS



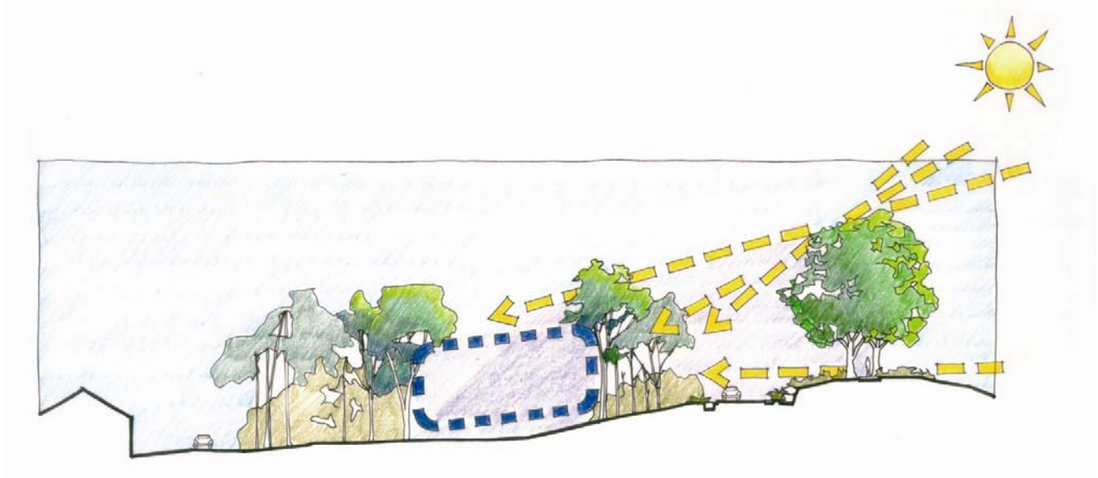
CLIMATE



VIEWS



SUMMER



WINTER